SECTION 03 3000

CAST-IN-PLACE CONCRETE

<<<<<< UPDATE NOTES

PART 1 GENERAL

2.01 SECTION INCLUDES

A. Concrete formwork.

B. Concrete building frame members.

C. Concrete for composite floor construction.

D. Elevated concrete slabs.

E. Floors and slabs on grade.

F. Concrete **<<*shear walls; elevator shaft walls; foundation walls; and _____*>>**.

G. Concrete foundations and anchor bolts for pre-engineered building.

H. Concrete foundations for water storage tank(s).

I. Concrete reinforcement.

J. Joint devices associated with concrete work.

K. Miscellaneous concrete elements, including **<<*equipment pads; light pole bases; flagpole bases; thrust blocks; manholes; and _____*>>**.

L. Concrete curing.

2.02 RELATED REQUIREMENTS

A. Section ***03 1000 - Concrete Forming and Accessories***: Forms and accessories for formwork.

B. Section ***03 2000 - Concrete Reinforcing***.

C. Section ***03 3511 - Concrete Floor Finishes***: Densifiers, hardeners, applied coatings, and polishing.

D. Section ***03 3523 - Exposed Aggregate Concrete Finishing***.

E. Section ***03 3533 - Stamped Concrete***: Additional requirements for patterned concrete surfaces.

F. Section ***06 0573 - Wood Treatment***: Field-applied termiticide and mildicide for concrete surfaces.

G. Section ***07 9200 - Joint Sealants***: Products and installation for sealants for saw cut joints and isolation joints in slabs.

H. Section ***07 9513 - Expansion Joint Cover Assemblies***.

I. Section ***32 1313 - Concrete Paving***: Sidewalks, curbs and gutters.

J. Section _____: Mechanical items for casting into concrete.

K. Section _____: Electrical items for casting into concrete.

2.03 PRICE AND PAYMENT PROCEDURES

A. **<<*Cast-in-place concrete; Certain cast-in-place concrete; or _____*>>** work will be paid for by the unit price method.

B. See Section ***01 2200 - Unit Prices***, for additional unit price requirements.

C. Concrete - **<<*Slab-on-Fill; Slab-on-Grade; or _____*>>**: Includes formwork**<<** ***as specified in Section 03 1000; or None - N/A*>>**, reinforcement**<<** ***as specified in Section 03 2000; or None - N/A*>>**, concrete, placement accessories, consolidating and leveling, troweling, and curing. Measurement by:

1. Square **<<*foot (meter); _____ (_____)*>>**.
2. Cubic **<<*yard (meter); _____ (_____)*>>**.

D. Concrete - Vertical in Forms: Includes formwork**<< *as specified in Section 03 1000; or None - N/A*>>**, reinforcement**<< *as specified in Section 03 2000; or None - N/A*>>**, concrete, placement accessories, consolidating, and curing. Measurement by:
   1. Square **<<*foot (meter); _____ (_____)*>>**.
   2. Cubic **<<*yard (meter); _____ (_____)*>>**.

E. Concrete - Miscellaneous Locations: Includes formwork**<< *as specified in Section 03 1000; or None - N/A*>>**, reinforcement**<< *as specified in Section 03 2000; or None - N/A*>>**, concrete, placement accessories, consolidating, and curing. Measurement by:
   1. Square **<<*foot (meter); _____ (_____)*>>**.
   2. Cubic **<<*yard (meter); _____ (_____)*>>**.

F. Concrete - Grouting: Includes preparation of substrate, grout, placement, consolidating, troweling, and curing. Measurement by the cubic **<<*yard (meter); ____ (_____)*>>**.

G. Construction Joint Devices: Includes component, accessories, and installation. Measurement by the linear **<<*foot (meter); _____ (_____)*>>**.

2.04 REFERENCE STANDARDS

A. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials; 2010.

B. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; 1991 (Reapproved 2009).

C. ACI 211.2 - Standard Practice for Selecting Proportions for Structural Lightweight Concrete; 1998 (Reapproved 2004).

D. ACI 301 - Specifications for Structural Concrete; 2016.

E. ACI 302.1R - Guide for Concrete Floor and Slab Construction; 2004 (Errata 2007).

F. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000.

G. ACI 305R - Guide to Hot Weather Concreting; 2010.

H. ACI 306R - Cold Weather Concreting; 2010.

I. ACI 308R - Guide to Curing Concrete; 2001 (Reapproved 2008).

J. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2016).

K. ACI 347R - Guide to Formwork for Concrete; 2014.

L. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2016.

M. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement; 2009 (Reapproved 2015).

N. ASTM A775/A775M - Standard Specification for Epoxy-Coated Steel Reinforcing Bars; 2016.

O. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement; 2014.

P. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2017.

Q. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2016.

R. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2016b.

S. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2016a.

T. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens); 2016a.

U. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2015a.

V. ASTM C150/C150M - Standard Specification for Portland Cement; 2016.

W. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete; 2016.

X. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2016.

Y. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a (Reapproved 2016).

Z. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2011.

AA. ASTM C330/C330M - Standard Specification for Lightweight Aggregates for Structural Concrete; 2014.

AB. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2016.

AC. ASTM C579 - Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes; 2001 (Reapproved 2012).

AD. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2015.

AE. ASTM C685/C685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing; 2014.

AF. ASTM C827/C827M - Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures; 2016.

AG. ASTM C845/C845M - Standard Specification for Expansive Hydraulic Cement; 2012.

AH. ASTM C881/C881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete; 2015.

AI. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2016.

AJ. ASTM C1059/C1059M - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete; 2013.

AK. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2014a.

AL. ASTM C1116/C1116M - Standard Specification for Fiber-Reinforced Concrete; 2010a (Reapproved 2015).

AM. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures; 2015.

AN. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete; 2011.

AO. ASTM C1582/C1582M - Standard Specification for Admixtures to Inhibit Chloride-Induced Corrosion of Reinforcing Steel in Concrete; 2011.

AP. ASTM D471 - Standard Test Method for Rubber Property--Effect of Liquids; 2016a.

AQ. ASTM D695 - Standard Test Method for Compressive Properties of Rigid Plastics; 2015.

AR. ASTM D994/D994M - Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type); 2011 (Reapproved 2016).

AS. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 2004 (Reapproved 2013).

AT. ASTM D1752 - Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction; 2004a (Reapproved 2013).

AU. ASTM D2103 - Standard Specification for Polyethylene Film and Sheeting; 2015.

AV. ASTM D3963/D3963M - Standard Specification for Fabrication and Jobsite Handling of Epoxy-Coated Steel Reinforcing Bars; 2015.

AW. ASTM E154/E154M - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover; 2008a (Reapproved 2013).

AX. ASTM E1155 - Standard Test Method for Determining F(F) Floor Flatness and F(L) Floor Levelness Numbers; 2014.

AY. ASTM E1155M - Standard Test Method for Determining F(F) Floor Flatness and F(L) Floor Levelness Numbers (Metric); 2014.

AZ. ASTM E1643 - Standard Practice for Selection, Design, Installation and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs; 2011.

BA. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2011.

BB. ASTM E1993/E1993M - Standard Specification for Bituminous Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs; 1998 (Reapproved 2013).

BC. COE CRD-C 48 - Method of Test for Water Permeability of Concrete; 1992.

BD. COE CRD-C 513 - COE Specifications for Rubber Waterstops; 1974.

BE. COE CRD-C 572 - Corps of Engineers Specifications for Polyvinylchloride Waterstop; 1974.

BF. ICRI 310.2R - Selecting and Specifying Concrete Surface Preparation; 2013.

BG. NSF 61 - Drinking Water System Components - Health Effects; 2016.

BH. NSF 372 - Drinking Water System Components - Lead Content; 2016.

2.05 SUBMITTALS

A. See Section ***01 3000 - Administrative Requirements***, for submittal procedures.

B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
   1. For curing compounds, provide data on method of removal in the event of incompatibility with floor covering adhesives.
   2. For chemical-resistant waterstops, provide data on ASTM D471 test results.

C. Mix Design: Submit proposed concrete mix design.
   1. Indicate proposed mix design complies with requirements of ACI 301, Section 4 - Concrete Mixtures.
   2. Indicate proposed mix design complies with requirements of ACI 318, Chapter 5 - Concrete Quality, Mixing and Placing.

D. Samples for Pigment Color Selection: Submit manufacturer's complete sample chip set, including pigment number and required dosage rate for each color.

E. Verification Samples: Submit sample chips of specified colors indicating pigment numbers and required dosage rates, for subsequent comparison to installed concrete.

F. Samples: Submit samples of underslab vapor retarder to be used.

G. Samples: Submit ***<<two; or _____>>***, ***<<12 inch (305 mm); _____ inch (_____ mm)>>*** long samples of ***<<waterstops; construction joint devices; and _____>>***.

H. Test Reports: Submit termite-resistant sheet manufacturer's summary of independent laboratory and field testing for effectiveness in subterranean termite exclusion.

I. Manufacturer's Installation Instructions: For concrete accessories, indicate installation procedures and interface required with adjacent construction.

J. Sustainable Design Submittals: If any wood or wood-based form materials, including supports, are permanently installed in the project, submit documentation required for sustainably harvested wood as specified in Section ***01 6000 - Product Requirements***.

K. Sustainable Design Submittal: If any fly ash, ground granulated blast furnace slag, silica fume, rice hull ash, or other waste material is used in mix designs to replace Portland cement, submit the total volume of concrete cast in place, mix design(s) used showing the quantity of portland cement replaced, reports showing successful cylinder testing, and temperature on day of pour if cold weather mix is used**<<*; use LEED New Product Content Form; or None - N/A*>>**.

L. Project Record Documents: Accurately record actual locations of embedded utilities and components that will be concealed from view upon completion of concrete work.

M. Warranty: Submit manufacturer warranty and ensure forms have been completed in ***Owner***'s name and registered with manufacturer.

2.06 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 301 and ACI 318.
   1. Maintain **<<*one copy; or ____ copies*>>** of each document on site.

B. Follow recommendations of ACI 305R when concreting during hot weather.

C. Follow recommendations of ACI 306R when concreting during cold weather.

D. For slabs required to include moisture vapor reduction admixture (MVRA), do not proceed with placement unless manufacturer's representative is present for **<<*every; first; or _____*>>** day of placement.

2.07 MOCK-UP

A. Construct and erect mock-up panel for architectural concrete surfaces indicated to receive special treatment or finish as result of formwork.
   1. Panel Size: Sufficient to illustrate full range of treatment.
   2. Panel Size: **<<*6 by 6 feet (2 by 2 meters); __by __ feet (__by __ meters)*>>**.
   3. Panel Size: As indicated on drawings.
   4. Number of Panels: **<<*2; 3; __; or As indicated on drawings*>>**.
   5. Locate **<<*where directed; as indicated on drawings; or _____*>>**.

B. If requested by ***Architect***, cast concrete against mock-up panel. Obtain acceptance of resulting surface finish prior to erecting formwork.

C. Accepted mock-up panel is considered basis of quality for the finished work. Keep mock-up exposed to view for duration of concrete work.

D. Mock-up **<<*may; may not; or _____*>>** remain as part of the Work.

2.08 WARRANTY

A. See Section ***01 7800 - Closeout Submittals***, for additional warranty requirements.

B. Slabs with Moisture Vapor Reducing Admixture (MVRA): Provide warranty to cover the cost of flooring failures due to moisture migration from slabs for **<<*ten years; life of the concrete; or _____*>>**.
   1. Include cost of repair or removal of failed flooring, placement of topical moisture remediation system, and replacement of flooring with comparable flooring system.
   2. Provide warranty by manufacturer of MVRA matching terms of flooring adhesive or primer manufacturer's material defect warranty.

C. Moisture Emission Reducing Curing and Sealing Compound: Provide warranty to cost of flooring delamination failures for 10 years.
   1. Include cost of repair or removal of failed flooring, remediation with a moisture vapor impermeable surface coating, and replacement of flooring with comparable flooring system.

D. Termite-Resistant Vapor Barrier Sheet: Provide **<<*five; or ____*>>** year manufacturer's limited warranty.

PART 2 PRODUCTS

3.01 FORMWORK

A. Comply with requirements of Section ***03 1000***.

B. Formwork Design and Construction: Comply with guidelines of ACI 347R to provide formwork that will produce concrete complying with tolerances of ACI 117.

C. Form Materials: ***Contractor***'s choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.
   1. Form Facing for Exposed Finish Concrete: ***Contractor***'s choice of materials that will provide smooth, stain-free final appearance.
   2. Form Facing for Exposed Finish Concrete: ***<<Steel; Preformed plastic; Fiberglass; MDO plywood; or _____>>***.
   3. Earth Cuts: Do not use earth cuts as forms for vertical surfaces. Natural rock formations that maintain a stable vertical edge may be used as side forms.
   4. Form Coating: Release agent that will not adversely affect concrete***<< or interfere with application of coatings; or None - N/A>>***.
   5. Form Ties: ***<<Cone snap; Taper removable bolt; or _____>>*** type that will leave no metal within ***<<1-1/2 inches (38 mm); _____ inches (____ mm)>>*** of concrete surface.

3.02 REINFORCEMENT

A. Comply with requirements of Section ***03 2000***.

B. Reinforcing Steel: ASTM A615/A615M, Grade ***<<40 (40,000 psi) (280 MPa); 60 (60,000 psi) (420 MPa); 75 (75,000 psi) (520 MPa); 80 (80,000 psi) (550 MPa); 100 (100,000 psi) (690 MPa); ___ (_____ psi) (___ MPa)>>***.
   1. Type: ***<<Plain; Deformed; or ____>>*** billet-steel bars.
   2. Finish: Unfinished***<<, unless otherwise indicated; as scheduled; at _____; _____; or None - N/A>>***.
   3. Finish: Galvanized in accordance with ASTM A767/A767M, Class ***<<I; or II>><<, unless otherwise indicated; as scheduled; at _____; _____; or None - N/A>>***.
   4. Finish: Epoxy coated in accordance with ASTM A775/A775M***<<, unless otherwise indicated; as scheduled; at _____; _____; or None - N/A>>***.

C. Steel Welded Wire Reinforcement (WWR): ***<<Plain type, 1; Galvanized, plain type, ASTM A1064/A1064M; Deformed type, 1; Class A epoxy coated, deformed type, 1; or _____>>***.
   1. Form: ***<<Flat Sheets; Coiled Rolls; or _____>>***.
   2. WWR Style: ***<<6 x 12-W12 x W5 (152 x 305-MW77 x MW32); 4 x 8-W6 x W10 (102 x 203-MW39 x MW65); As indicated on drawings; _____ (_____)>>***.

D. Reinforcement Accessories:
   1. Tie Wire: Annealed, minimum ***<<16 gage, 0.0508 inch (1.29 mm); __ gage, __ inch (__ mm)>>***.
   2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
   3. Provide ***<<stainless steel; galvanized; plastic; plastic coated steel; or _____>>*** components for placement within ***<<1-1/2 inches (38 mm); ___ inches (___ mm)>>*** of weathering surfaces.

3.03 CONCRETE MATERIALS

A. Cement: ASTM C150/C150M, ***<<Type I - Normal; Type IA - Air Entraining; Type II - Moderate; Type IIA - Air Entraining; Type III - High Early Strength; Type IIIA - Air Entraining; Type IV - Low Heat of Hydration; Type V - Sulfate Resistant; or _____>>*** Portland type. ***<<Provide _____ manufactured by _____.; or None - N/A>>***
   1. Acquire all cement for entire project from same source.

B. Blended, Expansive Hydraulic Cement: ASTM C845/C845M, ***<<Type K; Type M; Type S; or _____>>***.

1. Manufacturers:
   a. CTS Cement Manufacturing Corporation**<<*; Type K Cement;; _____; or None - N/A*>>**: www.ctscement.com/sle.
   b. Euclid Chemical Company**<<*; EUCON MSA;; _____; or None - N/A*>>**: www.euclidchemical.com.
   c. _____.
   d. _____.
   e. Substitutions: **<<*See Section 01 6000 - Product Requirements; or Not permitted*>>**.

C. Fine and Coarse Aggregates: **<<*ASTM C 33; or _____*>>**.
   1. Acquire all aggregates for entire project from same source.

D. Lightweight Aggregate: ASTM C330/C330M.

E. Fly Ash: ASTM C618, Class **<<*F; C; C or F; or _____*>>**.

F. Calcined Pozzolan: ASTM C618, Class N.

G. Silica Fume: ASTM C1240, proportioned in accordance with ACI 211.1.

H. Color Additives: Pure, concentrated mineral pigments specifically intended for mixing into concrete and complying with ASTM C979/C979M.
   1. Concentration: Base dosage rates on weight of Portland cement, fly ash, silica fume, and other cementitious materials but not aggregate or sand.
   2. Packaging: If pigments are to be added to mix at site, furnish pigments in premeasured disintegrating bags to minimize job site waste.
   3. Color(s): As indicated on drawings.
   4. Color(s): To match ***Architect***'s sample(s) when incorporated into specified mix design(s).
   5. Color(s): As selected by ***Architect*** from manufacturer's full range.
      a. Allow for ____ different pigment colors.
      b. Allow for up to ____ percent dosage for each color.
   6. Color: _____ at dosage rate of ____ percent.
   7. Manufacturers:
      a. BRICKFORM**<<*; BRICKFORM Liquid Integral Color;: BRICKFORM Powdered Integral Color;; Product ____; or None - N/A*>>**: www.brickform.com/sle.
      b. Butterfield Color**<<*;_____; or None - N/A*>>**: www.butterfieldcolor.com.
      c. Davis Colors**<<*;_____; or None - N/A*>>**: www.daviscolors.com.
      d. Euclid Chemical Company**<<*; COLOR-CRETE;; _____; or None - N/A*>>**: www.euclidchemical.com.
      e. Lambert Corporation**<<*;_____; or None - N/A*>>**: www.lambertusa.com.
      f. L.M. Scofield Company**<<*; CHROMIX® Admixtures for Color-Conditioned® Concrete;; SCOFIELD® Integral Color SG;; _____; or None - N/A*>>**: www.scofield.com.
      g. Solomon Colors**<<*; Solomon ColorFlo Liquid Colors;; Solomon Dry Integral Colors;; ____; or None - N/A*>>**: www.solomoncolors.com/sle
      h. _____.
      i. _____.
      j. Substitutions: **<<*See Section 01 6000 - Product Requirements; Not permitted.; or _____*>>**.

I. Water: Clean and not detrimental to concrete.

J. Structural Fiber Reinforcement: ASTM C1116/C1116M.
   1. Fiber Type: Alkali-resistant **<<*polypropylene; synthetic; cellulose; glass fiber; or ____*>>**.
   2. Fiber Length: **<<*0.25 inch (6 mm); 0.5 inch (12 mm); 0.75 inch (19 mm); 1.5 inch (38 mm); 2.0 inch (50.66 mm); 2.25 inch (57 mm); 2.5 inch (63.3 mm); ____inch (__ mm)*>>**, nominal.
   3. Manufacturers:

a. Euclid Chemical Company**<<*; TUF-STRAND ____;; _____; or None - N/A*>>**: www.euclidchemical.com.
b. Forta Corporation**<<*; FORTA-FERRO;; GREEN-NET;; FORTA ULTRA-LITE;; ULTRA-NET;; SUPER-NET;; ECONO-NET;; MIGHTY-MONO;; NYLO-MONO;; ECONO-MONO;; ____; or None - N/A*>>**: www.forta-ferro.com.
c. GCP Applied Technologies**<<*; STRUX 90/40;; ___; or None - N/A*>>**: www.gcpat.com/concrete/sle.
d. GCP Applied Technologies**<<*; STRUX BT50;; ___; or None - N/A*>>**: www.gcpat.com/concrete/sle.
e. _____.
f. _____.
g. Substitutions: **<<*See Section 01 6000 - Product Requirements; Not permitted; or _____*>>**.

K. Early Age Crack-Control Fiber Reinforcement: ASTM C1116/C1116M.
1. Fiber Type: Alkali-resistant **<<*polypropylene; synthetic; cellulose; glass fiber; or ____*>>**.
2. Fiber Length: **<<*0.25 inch (6 mm); 0.5 inch (12 mm); 0.75 inch (19 mm); 1.5 inch (38 mm); 2.0 inch (50.66 mm); 2.25 inch (57 mm); 2.5 inch (63.3 mm); ____inch (__ mm)*>>**, nominal.
3. Manufacturers:
a. Euclid Chemical Company**<<*; PSI Fiberstrand ____;; _____; or None - N/A*>>**: www.euclidchemical.com.
b. GCP Applied Technologies**<<*; Grace Fibers;; ___; or None - N/A*>>**: www.gcpat.com/concrete/sle.
c. GCP Applied Technologies**<<*; Grace MicroFiber;; ___; or None - N/A*>>**: www.gcpat.com/concrete/sle.
d. Solomon Colors**<<*; Solomon Colors UltraFiber 500;; Solomon Colors UltraFiber 302 Blend;; ____; or None - N/A*>>**: www.solomoncolors.com/sle.
e. _____.
f. _____.
g. Substitutions: **<<*See Section 01 6000 - Product Requirements; Not permitted; or _____*>>**.

3.04 ADMIXTURES

A. Chemical Admixture Manufacturers:
1. _____.
2. _____.
3. Substitutions: **<<*See Section 01 6000 - Product Requirements; Not permitted; or _____*>>**.

B. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.

C. Air Entrainment Admixture: ASTM C260/C260M.
1. Manufacturers:
a. _____.
b. _____.
c. Substitutions: **<<*See Section 01 6000 - Product Requirements; Not permitted; or _____*>>**.

D. High Range Water Reducing and Retarding Admixture: ASTM C494/C494M Type G.
1. Manufacturers:
a. _____.
b. _____.
c. Substitutions: **<<*See Section 01 6000 - Product Requirements; Not permitted; or _____*>>**.

E. High Range Water Reducing Admixture: ASTM C494/C494M Type F.
   1. Manufacturers:
      a. Euclid Chemical Company**<<*; PLASTOL 6420;; _____; or None - N/A*>>**: www.euclidchemical.com.
      b. _____.
      c. _____.
      d. Substitutions: **<<*See Section 01 6000 - Product Requirements; Not permitted; or _____*>>**.

F. Water Reducing and Accelerating Admixture: ASTM C494/C494M Type E.
   1. Manufacturers:
      a. Euclid Chemical Company**<<*; ACCELGUARD 80;; _____; or None - N/A*>>**: www.euclidchemical.com.
      b. _____.
      c. _____.
      d. Substitutions: **<<*See Section 01 6000 - Product Requirements; Not permitted; or _____*>>**.

G. Water Reducing and Retarding Admixture: ASTM C494/C494M Type D.
   1. Provide pigmented type, with ASTM C979/C979M inorganic pigments.
   2. Manufacturers:
      a. _____.
      b. _____.
      c. Substitutions: **<<*See Section 01 6000 - Product Requirements; Not permitted; or _____*>>**.

H. Accelerating Admixture: ASTM C494/C494M Type C.
   1. Manufacturers:
      a. W.R. Meadows, Inc**<<*; Hydraset;; Hydraset-Free (without calcium chloride);; _____; or None - N/A*>>**: www.wrmeadows.com/sle.
      b. _____.
      c. _____.
      d. Substitutions: **<<*See Section 01 6000 - Product Requirements; Not permitted; or _____*>>**.

I. Retarding Admixture: ASTM C494/C494M Type B.
   1. Manufacturers:
      a. _____.
      b. _____.
      c. Substitutions: **<<*See Section 01 6000 - Product Requirements; Not permitted; or _____*>>**.

J. Water Reducing Admixture: ASTM C494/C494M Type A.
   1. Manufacturers:
      a. Euclid Chemical Company**<<*; EUCON NW;; _____; or None - N/A*>>**: www.euclidchemical.com.
      b. _____.
      c. _____.
      d. Substitutions: **<<*See Section 01 6000 - Product Requirements; Not permitted; or _____*>>**.

K. Shrinkage Reducing Admixture:
   1. ASTM C494/C494M, Type S.
   2. Manufacturers:
      a. Euclid Chemical Company**<<*; Eucon SRA Floor;; _____; or None - N/A*>>**: www.euclidchemical.com.
      b. Euclid Chemical Company**<<*; Eucon SRA-XT;; _____; or None - N/A*>>**: www.euclidchemical.com.

c. GCP Applied Technologies**<<*; Eclipse Floor 200;; ___; or None - N/A*>>**: www.gcpat.com/concrete/sle.
d. GCP Applied Technologies**<<*; Eclipse 4500;; ___; or None - N/A*>>**: www.gcpat.com/concrete/sle.
e. _____.
f. _____.
g. Substitutions: **<<*See Section 01 6000 - Product Requirements; Not permitted; or _____*>>**.

L. Shrinkage Compensating Admixture: For on site production of concrete with ASTM C845/C845M, **<<*Type K; Type M; Type S; or _____*>>** cement.
1. Manufacturers:
a. CTS Cement Manufacturing Corporation**<<*; Komponent;; _____; or None - N/A*>>**: www.ctscement.com/sle.
b. _____.
c. _____.
d. Substitutions: **<<*See Section 01 6000 - Product Requirements; or Not permitted*>>**.

M. Shrinkage Compensating Admixture with Fiber Reinforcement: For on site production of concrete with ASTM C845/C845M, **<<*Type K; Type M; Type S; or _____*>>** cement with integral fiber reinforcement.
1. Manufacturers:
a. CTS Cement Manufacturing Corporation**<<*; System K;; _____; or None - N/A*>>**: www.ctscement.com/sle.
b. _____.
c. _____.
d. Substitutions: **<<*See Section 01 6000 - Product Requirements; or Not permitted*>>**.

N. Corrosion Inhibiting Admixture:
1. ASTM C494/C494M, Type C.
2. ASTM C1582/C1582M.
3. Manufacturers:
a. Euclid Chemical Company**<<*; EUCON CIA;; _____; or None - N/A*>>**: www.euclidchemical.com.
b. GCP Applied Technologies**<<*; DCI;; DCI S;; ___; or None - N/A*>>**: www.gcpat.com/concrete/sle.
c. GCP Applied Technologies**<<*; DCI; ; DCI S;; ___; or None - N/A*>>**: www.gcpat.com/concrete/sle.
d. _____.
e. _____.
f. Substitutions: **<<*See Section 01 6000 - Product Requirements; Not permitted; or _____*>>**.

O. Microbiologically-Induced Corrosion Inhibiting Admixture: Resists growth of bacteria and fungi on or inside concrete.
1. Manufacturers:
a. ConShield Technologies, Inc**<<*; ConShield HD;; _____; or None - N/A*>>**: www.conshield.com/sle.
b. _____.
c. _____.
d. Substitutions: **<<*See Section 01 6000 - Product Requirements; Not permitted; or _____*>>**.

P. Moisture Vapor Reduction Admixture (MVRA): Liquid, inorganic admixture free of volatile organic compounds (VOCs) and formulated to close capillary systems formed during curing to

reduce moisture vapor emission and transmission, with no adverse effect on concrete properties.

1. Provide admixture in slabs to receive adhesively applied flooring***<<None - N/A; or roofing; or _____>>***.
2. Manufacturers:
   a. Barrier One, Inc***<<; Barrier One Moisture Vapor Reduction Admixture;; _____; or None - N/A>>***: www.barrierone.com.
   b. Hycrete, Inc***<<; V1000;; _____; or None - N/A>>***: www.hycrete.com.
   c. Specialty Products Group***<<; Vapor Lock 20/20;; _____; or None - N/A>>***: www.spggogreen.com.
   d. _____.
   e. _____.
   f. Substitutions: ***<<See Section 01 6000 - Product Requirements; Not permitted; or _____>>***.

Q. Waterproofing Admixture: Admixture formulated to reduce permeability to liquid water, with no adverse effect on concrete properties.
1. Admixture Composition: Crystalline, functioning by growth of crystals in capillary pores.
2. Admixture Composition: Hydrophobic polymer waterproofing and corrosion inhibitor, functioning by closing concrete pores and chemical bonding.
3. Permeability of Cured Concrete: No measurable leakage when tested in accordance with COE CRD-C 48 at ***<<350 feet (106 m); ____ feet (____ m)>>*** of head; provide test reports.
4. Potable Water Contact Approval: NSF certification for use on structures holding potable water, based on testing in accordance with NSF 61 and NSF 372.
5. Manufacturers:
   a. Aquafin, Inc***<<;_____; or None - N/A>>***: www.aquafin.net.
   b. ConShield Technologies, Inc***<<; Crystal X;; _____; or None - N/A>>***: www.conshield.com/sle.
   c. Euclid Chemical Company***<<; Eucon Vandex AM-10;; _____; or None - N/A>>***: www.euclidchemical.com.
   d. Hycrete, Inc***<<; W1000;; _____; or None - N/A>>***: www.hycrete.com.
   e. PENETRON International, Ltd, distributed by GCP Applied Technologies***<<; PENETRON Admix;; _____; or None - N/A>>***: www.penetron.com; www.gcpat.com/sle.
   f. Specialty Products Group***<<; Vapor Lock 20/21;; _____; or None - N/A>>***: www.spggogreen.com.
   g. W.R. Meadows, Inc; ADI-CON CW Plus: www.wrmeadows.com/sle.
   h. Xypex Chemical Corporation***<<; XYPEX Admix C-500;; ____; or None - N/A>>***: www.xypex.com.
   i. _____.
   j. _____.
   k. Substitutions: ***<<See Section 01 6000 - Product Requirements; Not permitted; or _____>>***.

3.05 ACCESSORY MATERIALS

A. Underslab Vapor Retarder: Multi-layer, fabric-, cord-, grid-, or aluminum-reinforced polyethylene or equivalent, complying with ASTM E1745, ***<<Class A; Class B; Class C; or _____>>***; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. The use of single ply polyethylene is prohibited.
1. Installation: Comply with ASTM E1643.
2. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations in vapor retarder.
3. Manufacturers:

a. Fortifiber Building Systems Group***<<; Moistop Ultra 10;; ____; or None - N/A>>***: www.fortifiber.com/sle.
b. Fortifiber Building Systems Group***<<; Moistop Ultra 15;; ____; or None - N/A>>***: www.fortifiber.com/sle.
c. Insulation Solutions, Inc; Viper VaporCheck II 15-mil (Class A): www.insulationsolutions.com.
d. Insulation Solutions, Inc; Viper VaporCheck II 10-mil (Class A): www.insulationsolutions.com.
e. Insulation Solutions, Inc; Viper VaporCheck II 10-mil (Class C): www.insulationsolutions.com.
f. Stego Industries, LLC***<<;____; or None - N/A>>***: www.stegoindustries.com.
g. W.R. Meadows, Inc; PERMINATOR ***<<Class A - 15 mils (0.38 mm); Class A - 10 mils (0.25 mm); ____ (____); or _____>>***: www.wrmeadows.com/sle.
h. _____.
i. _____.
j. Substitutions: ***<<See Section 01 6000 - Product Requirements; Not permitted; or _____>>***.

B. Termite-Resistant Vapor Barrier Sheet: Plastic sheet, complying with ASTM E1745, ***<<Class C; or _____>>***; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs, and for exclusion of subterranean termites.
1. Installation: Comply with ASTM E1643.
2. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, prefabricated boots, etc., for sealing seams and penetrations in vapor retarder.
3. Manufacturers:
a. Stego Technology LLC***<<; Pango Wrap;; ____; or None - N/A>> <<with Pango Tape; with Pango Claw Tape; or ____>>***: www.stegoindustries.com.
b. _____.
c. _____.
d. Substitutions: ***<<See Section 01 6000 - Product Requirements; or Not permitted>>***.

C. Insulated Underslab Vapor Retarder: Multi-layer product of high density closed-cell foam and high density polyethylene bubble sandwiched between outer layers of aluminum-reinforced polyethylene or equivalent, stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. The use of single ply polyethylene is prohibited.
1. Installation: Comply with ASTM E1643.
2. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations in vapor retarder.
3. Manufacturers:
a. Insulation Solutions, Inc***<<; Insul-Tarp;; ____; or None - N/A>>***: www.insulationsolutions.com.
b. _____.
c. _____.
d. Substitutions: ***<<See Section 01 6000 - Product Requirements; Not permitted; or _____>>***.

D. Underslab Waterproofing and Vapor Retarder: Semi-rigid bituminous membrane, seven-ply, complying with ASTM E1993/E1993M.
1. Composition: Weather-resistant coated, permanently bonded bituminous core board composed of an inner core, suspended and sealed within high melt point asphalt-impregnated felt, with glass mat liner and polyethylene anti-stick sheet.
2. Permeance: ***<<0.002 perms (0.1 ng/(Pa s sq m)); _____ perms (_____ ng/(Pa s sq m))>>***, maximum.
3. Tensile Strength: ***<<140 pounds-force/inch (24.5 kN/m); _____ pounds-force/inch (_____ kN/m)>>***, minimum.

4. Puncture Resistance: **<<90 pounds-force (400 N); _____ pounds-force (_____ N)>>**, minimum, when tested in accordance with ASTM E154/E154M.
5. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations.
6. Manufacturers:
   a. W.R. Meadows, Inc; PRECON-Blindside/Underslab Membrane: www.wrmeadows.com/sle.
   b. W.R. Meadows, Inc; PREMOULDED MEMBRANE VAPOR SEAL with PLASMATIC CORE: www.wrmeadows.com/sle.
   c. _____.
   d. _____.
   e. Substitutions: **<<See Section 01 6000 - Product Requirements; Not permitted; or _____>>**.

E. Non-Shrink Cementitious Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
1. Grout: Comply with ASTM C1107/C1107M.
2. Height Change, Plastic State; when tested according to ASTM C827/C827M:
   a. Maximum: Plus **<<4; or __>>** percent.
   b. Minimum: Plus **<<1; or __>>** percent.
3. Minimum Compressive Strength at 48 Hours, ASTM C109/C109M: **<<2,000 pounds per square inch (13.7 MPa); ____ pounds per square inch (____ MPa)>>**.
4. Minimum Compressive Strength at 48 Hours: **<<2,000 pounds per square inch (13.7 MPa); ____ pounds per square inch (____ MPa)>>**.
5. Minimum Compressive Strength at 28 Days, ASTM C109/C109M: **<<7,000 pounds per square inch (48 MPa); ____ pounds per square inch (____ MPa)>>**.
6. Minimum Compressive Strength at 28 Days: **<<7,000 pounds per square inch (48 MPa); ____ pounds per square inch (____ MPa)>>**.
7. Products containing aluminum powder are not permitted.
8. Products:
   a. _____.
   b. _____.
9. Flowable Products:
   a. Dayton Superior Corporation; Sure-Grip High Performance Grout: www.daytonsuperior.com.
   b. Dayton Superior Corporation; Sure-Grip Precision Grout: www.daytonsuperior.com.
   c. Dayton Superior Corporation; 1107 Advantage Grout: www.daytonsuperior.com.
   d. Dayton Superior Corporation; Multipurpose Grout: www.daytonsuperior.com.
   e. Euclid Chemical Company**<<; NS GROUT;; _____; or None - N/A>>**: www.euclidchemical.com.
   f. Five Star Products, Inc**<<; Five Star Fluid Grout 100;; ____; or None - N/A>>**: www.fivestarproducts.com.
   g. Kaufman Products Inc; SureGrout: www.kaufmanproducts.net.
   h. L&M Construction Chemicals, Inc, a subsidiary of Laticrete International, Inc.**<<; DURAGROUT;; _____; or None - N/A>>**: www.laticrete.com/our-products/concrete-construction-chemicals/#sle.
   i. ProSpec, an Oldcastle brand**<<; C-1107 Construction Grout;; _____; or None - N/A>>**: www.prospec.com.
   j. The QUIKRETE Companies**<<; QUIKRETE® Exterior Use Anchoring Cement;; _____; or None - N/A>>**: www.quikrete.com.
   k. SpecChem, LLC**<<; SC Precision Grout;; SC Multipurpose Grout;; _____; or None - N/A>>**: www.specchemllc.com/sle.
   l. SpecChem, LLC**<<; SpecRock;; _____; or None - N/A>>**: www.specchemllc.com/sle.
   m. W. R. Meadows, Inc; 588-10K: www.wrmeadows.com/sle.

n. W. R. Meadows, Inc; 1428 HP: www.wrmeadows.com/sle.
o. W. R. Meadows, Inc; CG-86: www.wrmeadows.com/sle.
p. W. R. Meadows, Inc; Speed-E-Roc: www.wrmeadows.com/sle.
q. _____.
r. _____.
s. Substitutions: **<<*See Section 01 6000 - Product Requirements*; Not permitted; or _____>>**.

10. Low-Slump, Dry Pack Products:
    a. Euclid Chemical Company**<<*; DRY PACK GROUT*;; _____; or None - N/A>>**: www.euclidchemical.com.
    b. Dayton Superior Corporation; Dri Pak Precast Grout: www.daytonsuperior.com.
    c. Dayton Superior Corporation; Turbo Grout HP 12: www.daytonsuperior.com.
    d. Dayton Superior Corporation; Turbo Grout LT 12: www.daytonsuperior.com.
    e. Five Star Products, Inc**<<*; Five Star Grout*;; ____; or None - N/A>>**: www.fivestarproducts.com.
    f. L&M Construction Chemicals, Inc, a subsidiary of Laticrete International, Inc**<<*; Duragrout*;; _____; or None - N/A>>**: www.lmcc.com.
    g. The QUIKRETE Companies**<<*; QUIKRETE® FastSet™ Non-Shrink Grout*;; QUIKRETE® Non-Shrink Precision Grout;; QUIKRETE® Non-Shrink General Purpose Grout;; _____; or None - N/A>>**: www.quikrete.com.
    h. SpecChem, LLC**<<*; SC Multipurpose Grout*;; _____; or None - N/A>>**: www.specchemllc.com/sle.
    i. W. R. Meadows, Inc; PAC-IT: www.wrmeadows.com/sle.
    j. _____.
    k. _____.
    l. Substitutions: **<<*See Section 01 6000 - Product Requirements*; Not permitted; or _____>>**.

F. Non-Shrink Epoxy Grout: Moisture-insensitive, two-part; consisting of epoxy resin, non-metallic aggregate, and activator.
1. Composition: High solids content material exhibiting positive expansion when tested in accordance with ASTM C827/C827M.
    a. Maximum Height Change: Plus **<<*4; or __*>>** percent.
    b. Minimum Height Change: Plus **<<*1; or __*>>** percent.
2. Minimum Compressive Strength at 7 days, ASTM C579: **<<*12,000 pounds per square inch (82.7 MPa); 16,000 pounds per square inch (110.3 MPa); ____ pounds per square inch (____ MPa)*>>**.
3. Minimum Compressive Strength at 7 days, ASTM D695: **<<*12,000 pounds per square inch (82.7 MPa); ____ pounds per square inch (____ MPa)*>>**.
4. Manufacturers:
    a. Euclid Chemical Company**<<*; E3-DEEP POUR*;; E3-FLOWABLE;; _____; or None - N/A>>**: www.euclidchemical.com.
    b. Dayton Superior Corporation; Epoxy Grout J55: www.daytonsuperior.com.
    c. Dayton Superior Corporation; Pro-Poxy 2000 NS: www.daytonsuperior.com.
    d. Dayton Superior Corporation; Pro-Poxy 2000 DP: www.daytonsuperior.com.
    e. Five Star Products, Inc**<<*; Five Star DP Epoxy Grout*;; ____; or None - N/A>>**: www.fivestarproducts.com.
    f. Five Star Products, Inc**<<*; Five Star HP Epoxy Grout*;; ____; or None - N/A>>**: www.fivestarproducts.com.
    g. SpecChem, LLC**<<*; SpecPoxy Grout*;; _____; or None - N/A>>**: www.specchemllc.com/sle.
    h. W.R. Meadows, Inc; REZI-WELD 3/2: www.wrmeadows.com/sle.
    i. _____.
    j. _____.

k. Substitutions: **<<*See Section 01 6000 - Product Requirements*; *Not permitted; or* _____>>**.

G. Heavy Duty, Abrasion-Resistant Concrete Floor Topping:
1. Manufacturers:
a. Euclid Chemical Company**<<*; EucoFloor 202*;; _____; or None - N/A>>**: www.euclidchemical.com.
b. L&M Construction Chemicals, Inc, a subsidiary of Laticrete International, Inc**<<*; EMERYTOP 400*;; _____; or None - N/A>>**: www.lmcc.com.
c. _____.
d. _____.
e. Substitutions: **<<*See Section 01 6000 - Product Requirements*; *or Not permitted*>>**.

H. Architectural Concrete Floor Topping and Resurfacer:
1. Minimum Compressive Strength at 28 Days, ASTM C109/C109M: **<<*6,500 pounds per square inch (45 MPa)*; *7,000 pounds per square inch (48 MPa)*; *____ pounds per square inch (____ MPa)*>>**.
2. Manufacturers:
a. CTS Cement Manufacturing Corporation**<<*; TRU Self-Leveling*;; _____; or None - N/A>>**: www.ctscement.com/sle.
b. CTS Cement Manufacturing Corporation**<<*; TRU PC Polished Concrete*;; _____; or None - N/A>>**: www.ctscement.com/sle.
c. _____.
d. _____.
e. Substitutions: **<<*See Section 01 6000 - Product Requirements*; *or Not permitted*>>**.

I. Non-Shrink Epoxy Chocking Compound:
1. Manufacturers:
a. Dayton Superior Corporation; Poxy-Chock: www.daytonsuperior.com.
b. Dayton Superior Corporation; Pro-Poxy Chock: www.daytonsuperior.com.
c. Kaufman Products Inc; K Pro HP Grout: www.kaufmanproducts.net.
d. _____.
e. _____.
f. Substitutions: **<<*See Section 01 6000 - Product Requirements*; *Not permitted; or* _____>>**.

---------- See below for new CURING MATERIALS article ----------

3.06 BONDING AND JOINTING PRODUCTS

A. Latex Bonding Agent: Non-redispersable acrylic latex, complying with ASTM C1059/C1059M, Type II.
1. Manufacturers:
a. Euclid Chemical Company; AKKRO-7T: www.euclidchemical.com.
b. Kaufman Products Inc; SureBond: www.kaufmanproducts.net.
c. Kaufman Products Inc; SureWeld: www.kaufmanproducts.net.
d. SpecChem, LLC; Strong Bond Acrylic Bonder: www.specchemllc.com/sle.
e. W.R. Meadows, Inc; ACRY-LOK: www.wrmeadows.com/sle.
f. _____.
g. _____.
h. Substitutions: **<<*See Section 01 6000 - Product Requirements*; *Not permitted; or* _____>>**.

B. Epoxy Bonding System:
1. Complying with ASTM C881/C881M and of Type required for specific application.
2. Manufacturers:

a. Adhesives Technology Corporation; Crackbond SLV302, Crackbond LR321, Crackbond LR321 LPL, Ultrabond 2100 LPL, Ultrabond 2100, Ultrabond 1, Ultrabond 2, or Ultrabond HS200: www.atcepoxy.com/sle.
b. Adhesives Technology Corporation; Crackbond LR321 G, Miracle Bond 1310 or Miracle Bond 1450: www.atcepoxy.com/sle.
c. Euclid Chemical Company; DURAL FAST SET LV: www.euclidchemical.com.
d. Euclid Chemical Company; DURALFLEX GEL: www.euclidchemical.com.
e. Euclid Chemical Company; DURALFLEX LV: www.euclidchemical.com.
f. Euclid Chemical Company; DURAL 452 GEL, DURAL 452 LV, or DURAL 452 MV: www.euclidchemical.com.
g. Dayton Superior Corporation; Slow Set Bonding Agent: www.daytonsuperior.com.
h. Dayton Superior Corporation; Perma Prime 3C: www.daytonsuperior.com.
i. Kaufman Products Inc; SurePoxy HM EPL: www.kaufmanproducts.net.
j. Kaufman Products Inc; SurePoxy HM Class B: www.kaufmanproducts.net.
k. SpecChem, LLC; SpecPoxy 1000, SpecPoxy 2000, SpecPoxy 3000, or SpecPoxy 3000FS: www.specchemllc.com/sle.
l. W.R. Meadows, Inc; Rezi-Weld Gel Paste, Rezi-Weld Gel Paste State, Rezi-Weld 1000: www.wrmeadows.com/sle.
m. _____.
n. _____.
o. Substitutions: **<<*See Section 01 6000 - Product Requirements*; Not permitted; or _____>>**.

C. Silane Hybrid Anchoring System:
1. Complying with ASTM C881/C881M and of Type required for specific application.
2. Manufacturers:
a. Adhesives Technology Corporation; ULTRABOND 365CC: www.atcepoxy.com/sle.
b. _____.
c. Substitutions: **<<*See Section 01 6000 - Product Requirements*; Not permitted; or _____>>**.

D. Waterproofing Admixture Slurry: Slurry coat of Portland cement, sand, and crystalline waterproofing additive, mixed with water in proportions recommended by manufacturer to achieve waterproofing at cold joints in concrete.
1. Manufacturers:
a. Aquafin, Inc**<<*;_____; or None - N/A*>>**: www.aquafin.net.
b. W.R. Meadows, Inc; ADI-CON CW Plus: www.wrmeadows.com/sle.
c. Xypex Chemical Corporation**<<*; XYPEX Concentrate;; ____; or None - N/A*>>**: www.xypex.com.
d. _____.
e. _____.
f. Substitutions: **<<*See Section 01 6000 - Product Requirements*; Not permitted; or _____>>**.

E. Waterstops: Rubber, complying with COE CRD-C 513.
1. Configuration: As indicated on the drawings.
2. Size: As indicated on the drawings.
3. Manufacturers:
a. _____.
b. _____.
c. Substitutions: **<<*See Section 01 6000 - Product Requirements*; Not permitted.; or _____>>**.

F. Waterstops: PVC, complying with COE CRD-C 572.
1. Configuration: As indicated on the drawings.
2. Size: As indicated on the drawings.
3. Manufacturers:

a. BoMetals, Inc**<<;_____; or None - N/A>>**: www.bometals.com/sle.
b. _____.
c. _____.
d. Substitutions: **<<See Section 01 6000 - Product Requirements; Not permitted; or _____>>**.

G. Waterstops: Bentonite and butyl rubber, complying with NSF 61 and NSF 372.
1. Configuration: As indicated on drawings.
2. Size: As indicated on drawings.
3. Manufacturers:
a. _____.
b. _____.
c. Substitutions: **<<See Section 01 6000 - Product Requirements; Not permitted; or _____>>**.

H. Waterstops, Chemical-Resistant: Extruded, thermoplastic, virgin rubber; no recycled or reclaimed material or pigments allowed.
1. Chemical Resistance: Tested in accordance with ASTM D471.
2. Configuration: As indicated on drawings.
3. Size: As indicated on drawings.
4. Manufacturers:
a. BoMetals, Inc**<<; TPER Waterstop;; ____; or None - N/A>>**: www.bometals.com/sle.
b. _____.
c. _____.
d. Substitutions: **<<See Section 01 6000 - Product Requirements; Not permitted; or _____>>**.

I. Reglets: Formed steel sheet, galvanized, with temporary filler to prevent concrete intrusion during placement.
1. Size: As indicated on drawings.
2. Size: **<<1/2 inch (12 mm); ___ inch (___ mm)>>** throat, **<<1/2 inch (12 mm); ___ inch (___ mm)>>** deep.

J. Slab Isolation Joint Filler: **<<1/2 inch (13 mm); 1/4 inch (6 mm); ____ inch (____ mm)>>** thick, height equal to slab thickness, with removable top section that will form **<<1/2 inch (13 mm); ___ inch (___ mm)>>** deep sealant pocket after removal.
1. Material: ASTM D1751, **<<cellulose fiber; cork; or _____>>**.
2. Material: ASTM D1752 **<<sponge rubber (Type I); cork (Type II); self-expanding cork (Type III); recycled PVC (Type IV); or _____>>**.
3. Material: Closed-cell, non-absorbent, compressible polyethylene or polymer foam in sheet form.
4. Manufacturers:
a. Nomaco, Inc**<<; Nomaflex;; _____; or None - N/A>>**: www.nomaco.com.
b. W.R. Meadows, Inc; Fiber Expansion Joint Filler with Snap-Cap: www.wrmeadows.com/sle.
c. W.R. Meadows, Inc**<<; Deck-O-Foam Joint Filler with pre-scored top strip;; Ceramar Joint Filler with Snap-Cap;; _____; or None - N/A>>**: www.wrmeadows.com/sle.
d. _____.
e. _____.
f. Substitutions: **<<See Section 01 6000 - Product Requirements; Not permitted; or _____>>**.

K. Slab Contraction Joint Device: Preformed linear strip intended for pressing into wet concrete to provide straight route for shrinkage cracking.
1. Manufacturers:
a. W.R. Meadows, Inc**<<; Speed-E-Joint;; Deck-O-Joint;; _____; or None - N/A>>**: www.wrmeadows.com/sle.

b. _____.
c. _____.
d. Substitutions: **<<*See Section 01 6000 - Product Requirements; Not permitted; or _____*>>**.

L. Slab Construction Joint Devices: Combination keyed joint form and screed, galvanized steel, with **<<*rectangular; square; round; or _____*>>** knockout holes for conduit or rebar to pass through joint form at **<<*6 inches (150 mm); ___ inches (___ mm)*>>** on center; ribbed steel stakes for setting.
1. Provide removable plastic cap strip that forms wedge-shaped joint for sealant installation.
2. Height: To suit slab thickness.
3. Manufacturers:
a. BoMetals, Inc**<<*; Quickey;; _____; or None - N/A*>>**: www.bometals.com/sle.
b. _____.
c. _____.
d. Substitutions: **<<*See Section 01 6000 - Product Requirements; Not permitted; or _____*>>**.

M. Dowel Sleeves: Plastic sleeve**<<*None - N/A; or and nailable plastic base*>>** for smooth, round, steel load-transfer dowels.
1. Products:
a. BoMetals, Inc**<<*; QuicDowel;; _____; or None - N/A*>>**: www.bometals.com/sle.
b. BoMetals, Inc**<<*; QuicLoad;; _____; or None - N/A*>>**: www.bometals.com/sle.
c. _____.
d. _____.
e. Substitutions: **<<*See Section 01 6000 - Product Requirements; Not permitted; or _____*>>**.

N. Plate Dowel System: Steel plate dowel and plastic dowel sleeve; with integral fasteners for attachment to formwork.
1. Manufacturers:
a. BoMetals, Inc**<<*; QuicPlate;; _____; or None - N/A*>>**: www.bometals.com/sle.
b. _____.
c. _____.
d. Substitutions: **<<*See Section 01 6000 - Product Requirements; Not permitted; or _____*>>**.

3.07 CURING MATERIALS

A. Evaporation Reducer: Liquid thin-film-forming compound that reduces rapid moisture loss caused by high temperature, low humidity, and high winds; intended for application immediately after concrete placement.
1. Manufacturers:
a. Dayton Superior Corporation; AquaFilm Concentrate J74: www.daytonsuperior.com.
b. Euclid Chemical Company; EUCOBAR: www.euclidchemical.com.
c. Kaufman Products Inc; VaporAid: www.kaufmanproducts.net.
d. SpecChem, LLC; SpecFilm Concentrate or SpecFilm RTU: www.specchemllc.com/sle.
e. W.R. Meadows, Inc; Evapre or Evapre-RTU: www.wrmeadows.com/sle.
f. _____.
g. _____.
h. Substitutions: **<<*See Section 01 6000 - Product Requirements; Not permitted; or _____*>>**.

B. Curing Compound, Naturally Dissipating: Clear, water-based, liquid membrane-forming compound; complying with ASTM C309.
1. Application: Use at _____.
2. Product dissipates within **<<*4 to 6 weeks; 30 to 60 days; 7 to 10 days; or _____*>>**.

3. Provide product containing fugitive red dye.
4. Manufacturers:
   a. Dayton Superior Corporation; Resin Cure with Dye J11WD: www.daytonsuperior.com.
   b. Dayton Superior Corporation; Clear Resin Cure J11W: www.daytonsuperior.com.
   c. Dayton Superior Corporation; Clear Cure VOC J7WB: www.daytonsuperior.com.
   d. Euclid Chemical Company***<<; COLOR-CRETE CURE AND SEAL VOC;; _____; or None - N/A>>***: www.euclidchemical.com.
   e. Kaufman Products Inc; Thinfilm 420 Resin Base: www.kaufmanproducts.net.
   f. SpecChem, LLC; SpecRez: www.specchemllc.com/sle.
   g. W.R. Meadows, Inc; 1100-Clear: www.wrmeadows.com/sle.
   h. _____.
   i. _____.
   j. Substitutions: ***<<See Section 01 6000 - Product Requirements; Not permitted; or _____>>***.

C. Curing Agent, Water Replacement Type: Clear, water based, liquid water cure replacement agent complying with ASTM C309 standards for water retention, and with ACI 302.1R.
   1. Application: Use at _____.
   2. Manufacturers:
      a. Sinak Corporation***<<; The CURE™WCE;; _____; or None - N/A>>***: www.sinak.com.
      b. _____.
      c. _____.
      d. Substitutions: ***<<See Section 01 6000 - Product Requirements; Not permitted; or _____>>***.

D. Curing and Anti-Spalling Compound: Boiled linseed oil compound.
   1. Application: Use on roadway, bridge deck, parking deck, and ramps.
   2. Manufacturers:
      a. Dayton Superior Corporation; Anti Spall J33: www.daytonsuperior.com.
      b. Euclid Chemical Company; LINSEED OIL TREATMENT: www.euclidchemical.com.
      c. W. R. Meadows, Inc; Lin-Seal, Lin-Seal Emulsion, or Lin-Seal White: www.wrmeadows.com/sle.
      d. _____.
      e. _____.
      f. Substitutions: ***<<See Section 01 6000 - Product Requirements; Not permitted; or _____>>***.

E. Wax Curing Compound: Water-based liquid, white pigmented, membrane-forming.
   1. Manufacturers:
      a. Dayton Superior Corporation; White Wax Cure J9A: www.daytonsuperior.com.
      b. Dayton Superior Corporation; White Wax Cure CRD300: www.daytonsuperior.com.
      c. Euclid Chemical Company; KUREZ VOX WHITE PIGMENTED: www.euclidchemical.com.
      d. Kaufman Products Inc; Thinfilm 445 Wax Base: www.kaufmanproducts.net.
      e. _____.
      f. _____.
      g. Substitutions: ***<<See Section 01 6000 - Product Requirements; Not permitted; or _____>>***.

F. Resin Curing Compound: Solvent-based liquid, white pigmented, membrane-forming.
   1. For use on exterior slabs. When slab will be painted, sealed, topped, or receive other applied finish, completely remove curing compound after curing is complete and before finish coatings are applied.
   2. Comply with ASTM C309, Type 2, Classes A and B.
   3. VOC Content: Less than 350 g/L.
   4. Solids Content: 20 percent, minimum.

5. Manufacturers:
   a. Dayton Superior Corporation; White Resin Cure J10W: www.daytonsuperior.com.
   b. Euclid Chemical Company: KUREZ DR-100: www.euclidchemical.com.
   c. Euclid Chemical Company: KUREZ DR-VOX: www.euclidchemical.com.
   d. Kaufman Products Inc; Thinfilm 450 Resin Base: www.kaufmanproducts.net.
   e. _____.
   f. _____.
   g. Substitutions: **<<*See Section 01 6000 - Product Requirements*; Not permitted; or _____>>**.

G. Curing and Sealing Compound, Moisture Emission Reducing: Liquid, membrane-forming, clear sealer, for application to newly placed concrete; capable of providing adequate bond for flooring adhesives, initially and over the long term; with sufficient moisture vapor impermeability to prevent deterioration of flooring adhesives due to moisture emission.
   1. Use this product to cure and seal all slabs to receive adhesively applied flooring or roofing.
   2. Comply with ASTM C309 and ASTM C1315 Type I Class A.
   3. VOC Content: Less than 100 g/L.
   4. Solids Content: 25 percent, minimum.
   5. Manufacturers:
      a. Floor Seal Technology, Inc; VaporSeal 309 System: www.floorseal.com.
      b. Sinak Corporation**<<*; VC5; _____; or None - N/A*>>**: www.sinak.com.
      c. _____.
      d. _____.
      e. Substitutions: **<<*See Section 01 6000 - Product Requirements*; Not permitted; or _____>>**.

H. Curing Compound, Non-dissipating: Liquid, membrane-forming, clear, non-yellowing acrylic; complying with ASTM C309.
   1. Application: Use at _____.
   2. Vehicle: **<<*Water-based*; Solvent-based; or _____>>**.
   3. Gloss: **<<*Low*; *High*; or ___>>**.
   4. Solids by Mass: **<<*18 percent*; 25 percent; or _____>>**, minimum.
   5. VOC Content: OTC compliant.
   6. Manufacturers:
      a. BRICKFORM; BRICKFORM Gem Cure and Seal 309 - 100 VOC: www.brickform.com/sle.
      b. BRICKFORM; BRICKFORM Gem Cure and Seal 309 - 350 VOC: www.brickform.com/sle.
      c. Dayton Superior Corporation; Cure & Seal LV 25% J20UV: www.daytonsuperior.com.
      d. Dayton Superior Corporation; Cure & Seal 25% J22UV: www.daytonsuperior.com.
      e. Dayton Superior Corporation; Cure & Seal 30% J23UV: www.daytonsuperior.com.
      f. Dayton Superior Corporation; Cure & Seal 309 J18: www.daytonsuperior.com.
      g. Dayton Superior Corporation; Cure & Seal 309 EF: www.daytonsuperior.com.
      h. Kaufman Products Inc; Krystal 15 Emulsion: www.kaufmanproducts.net.
      i. L&M Construction Chemicals, Inc., a subsidiary of Laticrete International, Inc**<<*; Dress & Seal;; _____; or None - N/A*>>**: www.lmcc.com.
      j. L&M Construction Chemicals, Inc., a subsidiary of Laticrete International, Inc**<<*; Dress & Seal WB;; _____; or None - N/A*>>**: www.lmcc.com.
      k. L&M Construction Chemicals, Inc., a subsidiary of Laticrete International, Inc**<<*; Dress & Seal WB 30;; _____; or None - N/A*>>**: www.lmcc.com.
      l. The QUIKRETE Companies**<<*; QUIKRETE® Acrylic Concrete Cure & Seal;; _____; or None - N/A*>>**: www.quikrete.com.
      m. SpecChem, LLC; Cure & Seal 25: www.specchemllc.com/sle.
      n. SpecChem, LLC; Cure and Seal WB: www.specchemllc.com/sle.
      o. SpecChem, LLC; Cure and Seal WB 25: www.specchemllc.com/sle.

p. W.R. Meadows, Inc; VOCOMP-20: www.wrmeadows.com/sle.
q. _____.
r. _____.
s. Substitutions: **<<*See Section 01 6000 - Product Requirements*; Not permitted; or _____>>**.

I. Curing and Sealing Compound, Low Gloss: Liquid, membrane-forming, clear, non-yellowing acrylic; complying with ASTM C1315 Type 1 Class A.
1. Application: Use at _____.
2. Vehicle: **<<*Water-based; Solvent-based; or _____*>>**.
3. Solids by Mass: **<<*25 percent; 30 percent; or _____*>>**, minimum.
4. VOC Content: OTC compliant.
5. Manufacturers:
a. Concrete Sealers USA**<<*;_____; or None - N/A*>>**: www.concretesealersusa.com.
b. Dayton Superior Corporation; Cure & Seal 1315 J22WB: www.daytonsuperior.com.
c. Dayton Superior Corporation; Cure & Seal 1315 EF: www.daytonsuperior.com.
d. Euclid Chemical Company; DIAMOND CLEAR VOX: www.euclidchemical.com.
e. Euclid Chemical Company; SUPER DIAMOND CLEAR: www.euclidchemical.com.
f. Euclid Chemical Company; SUPER DIAMOND CLEAR 350: www.euclidchemical.com.
g. Kaufman Products Inc; Krystal 25: www.kaufmanproducts.net.
h. Kaufman Products Inc; Krystal 25 OTC, or Krystal 25 Emulsion: www.kaufmanproducts.net.
i. Kaufman Products Inc; Krystal 30: www.kaufmanproducts.net.
j. Kaufman Products Inc; Krystal 30 OTC, or Krystal 30 Emulsion: www.kaufmanproducts.net.
k. W.R. Meadows, Inc; VOCOMP-25: www.wrmeadows.com/sle.
l. W.R. Meadows, Inc; CS-309 OTC: www.wrmeadows.com/sle.
m. W.R. Meadows, Inc; CS-309-25: www.wrmeadows.com/sle.
n. W.R. Meadows, Inc; CS-309-25 OTC: www.wrmeadows.com/sle.
o. W.R. Meadows, Inc; CS-309-30: www.wrmeadows.com/sle.
p. W.R. Meadows, Inc; CS-309-30 OTC: www.wrmeadows.com/sle.
q. W.R. Meadows, Inc; TIAH: www.wrmeadows.com/sle.
r. W.R. Meadows, Inc; TIAH OTC: www.wrmeadows.com/sle.
s. _____.
t. _____.
u. Substitutions: **<<*See Section 01 6000 - Product Requirements*; Not permitted; or _____>>**.

J. Curing and Sealing Compound, High Gloss: Liquid, membrane-forming, clear, non-yellowing acrylic; complying with ASTM C1315 Type 1 Class A.
1. Application: Use at _____.
2. Vehicle: **<<*Water-based; Solvent-based; or _____*>>**.
3. Solids by Mass: **<<*25 percent; 30 percent; or _____*>>**, minimum.
4. VOC Content: OTC compliant.
5. Manufacturers:
a. BRICKFORM; BRICKFORM Gem Cure and Seal 1315 - 350 VOC: www.brickform.com/sle.
b. BRICKFORM: BRICKFORM Gem Cure and Seal 1315 - 650 VOC: www.brickform.com/sle.
c. Concrete Sealers USA**<<*;_____; or None - N/A*>>**: www.concretesealersusa.com.
d. Kaufman Products Inc; Krystal 25: www.kaufmanproducts.net.
e. Kaufman Products Inc; Krystal 25 OTC, or Krystal 25 Emulsion: www.kaufmanproducts.net.
f. Kaufman Products Inc; Krystal 30: www.kaufmanproducts.net.

g. Kaufman Products Inc; Krystal 30 OTC, or Krystal 30 Emulsion: www.kaufmanproducts.net.
h. SpecChem, LLC**<<*; Cure and Seal WB;; _____; or None - N/A*>>**: www.specchemllc.com/sle.
i. SpecChem, LLC**<<*; Cure and Seal WB 25;; _____; or None - N/A*>>**: www.specchemllc.com/sle.
j. SpecChem, LLC**<<*; Cure and Seal WB 30;; _____; or None - N/A*>>**: www.specchemllc.com/sle.
k. SpecChem, LLC**<<*; Surface Shine WB;; _____; or None - N/A*>>**: www.specchemllc.com/sle.
l. W.R. Meadows, Inc; VOCOMP-30: www.wrmeadows.com/sle.
m. W.R. Meadows, Inc; Decra-Seal: www.wrmeadows.com/sle.
n. W.R. Meadows, Inc; Decra-Seal OTC: www.wrmeadows.com/sle.
o. W.R. Meadows, Inc; Deck-O-Grip: www.wrmeadows.com/sle.
p. _____.
q. _____.
r. Substitutions: **<<*See Section 01 6000 - Product Requirements; Not permitted; or _____*>>**.

K. Moisture-Retaining Sheet: ASTM C171.
1. Curing paper, **<<*regular; white; or _____*>>**.
2. Polyethylene film, **<<*clear; white opaque; or _____*>>**, minimum nominal thickness of **<<*0.0040 inch (0.10 mm); ____ inch (_____ mm)*>>**.
3. White-burlap-polyethylene sheet, weighing not less than ***10 ounces per linear yard, 40 inches wide (305 g/sq m)***.
4. Provide _____ manufactured by _____.

L. Polyethylene Film: ASTM D2103, **<<*4 mil (0.1 mm); 6 mil (0.15 mm); ___ mil (____ mm)*>>** thick, **<<*clear; white opaque color; or _____*>>**.

M. Water: Potable, not detrimental to concrete.

3.08 CONCRETE MIX DESIGN

A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.
1. Replace as much Portland cement as possible with fly ash, ground granulated blast furnace slag, silica fume, or rice hull ash as is consistent with ACI recommendations.

B. Proportioning Structural Lightweight Concrete: Comply with ACI 211.2 recommendations.
1. Replace as much Portland cement as possible with fly ash, ground granulated blast furnace slag, silica fume, or rice hull ash as is consistent with ACI recommendations.

C. Concrete Strength: Establish required average strength for**<<** ***each type of; or None - N/A*>>** concrete on the basis of **<<*field experience; trial mixtures; or _____*>>**, as specified in ACI 301.
1. For trial mixtures method, employ independent testing agency acceptable to ***Architect*** for preparing and reporting proposed mix designs.

D. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended or required by manufacturer.

E. Fiber Reinforcement: Add to mix at rate of **<<*1.5 pounds per cubic yard (0.89 kg per cubic meter); ___ pounds per cubic yard (____ kg per cubic meter)*>>**, or as recommended by manufacturer for specific project conditions.

F. Normal Weight Concrete:
1. Compressive Strength, when tested in accordance with ASTM C39/C39M at **<<*28; or ____*>>** days: **<<*3,000 pounds per square inch (20.7 MPa); 4,000 pounds per square inch (27.6 MPa); 5,000 pounds per square inch (34.5 MPa); _____ pounds per square inch (_____ MPa); As scheduled; As indicated on drawings; or _____*>>**.

2. Fly Ash Content: Maximum ***<<15; 25; 35; or __>>*** percent of cementitious materials by weight.
3. Calcined Pozzolan Content: Maximum ***<<10; 20; or __>>*** percent of cementitious materials by weight.
4. Silica Fume Content: Maximum ***<<5; 15; or __>>*** percent of cementitious materials by weight.
5. Cement Content: Minimum ***____ lb per cubic yard (____ kg per cubic meter)***.
6. Water-Cement Ratio: Maximum ***<<40; or __>>*** percent by weight.
7. Total Air Content: ***<<3; 4; 4-1/2; 5; 6; 7; or __>>*** percent, determined in accordance with ASTM C173/C173M.
8. Maximum Slump: ***<<2 inches (50 mm); 3 inches (75 mm); 4 inches (100 mm); __ inches (___ mm)>>***.
9. Maximum Aggregate Size: ***<<3/4 inch (19 mm); 5/8 inch (16 mm); 1/2 inch (13 mm); ___ inch (___ mm)>>***.

G. Structural Lightweight Concrete:
1. Compressive Strength, when tested in accordance with ASTM C39/C39M at ***<<28; or ____>>*** days: ***<<3,000 pounds per square inch (20.7 MPa); 4,000 pounds per square inch (27.6 MPa); 5,000 pounds per square inch (34.5 MPa); _____ pounds per square inch (_____ MPa); As scheduled; As indicated on drawings; or _____>>***.
2. Cement Content: Minimum ***____ lb per cubic yard (____ kg per cubic meter)***.
3. Water-Cement Ratio: Maximum ***<<40; 45; 50; or __>>*** percent by weight.
4. Total Air Content: ***<<3; 4; 4-1/2; 5; 6; 7; or __>>*** percent, determined in accordance with ASTM C173/C173M.
5. Maximum Slump: ***<<3 inches (75 mm); 4 inches (100 mm); __ inches (___ mm)>>***.
6. Maximum Aggregate Size: ***<<3/4 inch (19 mm); 5/8 inch (16 mm); 1/2 inch (13 mm); __ inch (__ mm)>>***.
7. Maximum dry unit weight: ***<<115 lb per cubic foot (1840 kg per cubic meter); ___ lb per cubic foot (____ kg per cubic meter)>>***.

3.09 MIXING

A. On Project Site: Mix in drum type batch mixer, complying with ASTM C685/C685M. Mix each batch not less than 1-1/2 minutes and not more than 5 minutes.
1. Colored Concrete: Add pigments in strict accordance with manufacturer's instructions to achieve consistent color from batch to batch.
2. Fiber Reinforcement: Batch and mix as recommended by manufacturer for specific project conditions.

B. Transit Mixers: Comply with ASTM C94/C94M.

PART 3 EXECUTION

4.01 EXAMINATION

A. Verify lines, levels, and dimensions before proceeding with work of this section.

4.02 PREPARATION

A. Formwork: Comply with requirements of ACI 301. Design and fabricate forms to support all applied loads until concrete is cured, and for easy removal without damage to concrete.

B. Verify that forms are clean***<< and free of rust; or None - N/A>>*** before applying release agent.

C. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.

D. Prepare existing concrete surfaces to be repaired according to ICRI 310.2R***<<, CSP 3;, CSP 4;, CSP 5;, CSP 6;, CSP 7;, CSP 8;, CSP 9; ,_____; or None - N/A>>***.

E. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning and applying bonding agent in according to bonding agent manufacturer's instructions.

1. Use epoxy bonding system for bonding to damp surfaces, for structural load-bearing applications, and where curing under humid conditions is required.
2. Use latex bonding agent only for non-load-bearing applications.

F. Where new concrete with integral waterproofing is to be bonded to previously placed concrete, prepare surfaces to be treated in accordance with waterproofing manufacturer's instructions. Saturate cold joint surface with clean water, and remove excess water before application of coat of waterproofing admixture slurry. Apply slurry coat uniformly with semi-stiff bristle brush at rate recommended by waterproofing manufacturer.

G. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.

H. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade. Lap joints minimum ***<<6 inches (150 mm); ____ inches (____ mm)>>***. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions. Repair damaged vapor retarder before covering.
1. Granular Fill Over Vapor Retarder: Cover vapor retarder with compactible granular fill as shown on the drawings. Do not use sand.
2. Vapor Retarder Over Granular Fill: Install compactible granular fill before placing vapor retarder as shown on the drawings. Do not use sand.

4.03 INSTALLING REINFORCEMENT AND OTHER EMBEDDED ITEMS

A. Fabricate and handle epoxy-coated reinforcing in accordance with ASTM D3963/D3963M.

B. Comply with requirements of ACI 301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.

C. Install welded wire reinforcement in maximum possible lengths, and offset end laps in both directions. Splice laps with tie wire.

D. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with concrete placement.

4.04 PLACING CONCRETE

A. Place concrete in accordance with ACI 304R.

B. Place concrete for floor slabs in accordance with ACI 302.1R.

C. Notify ***Architect*** not less than 24 hours prior to commencement of placement operations.

D. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

E. Ensure ***<<reinforcement; inserts; waterstops; embedded parts; formed construction joint devices; and _____>>*** will not be disturbed during concrete placement.

F. Place concrete continuously without construction (cold) joints wherever possible; where construction joints are necessary, before next placement prepare joint surface by removing laitance and exposing the sand and sound surface mortar, by sandblasting or high-pressure water jetting.

G. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.

---------- SEE BELOW FOR NEW TEXT ON SLAB JOINTING AND FLOOR TOLERANCES ----

4.05 SLAB JOINTING

A. Locate joints as indicated on the drawings.

B. Anchor joint fillers and devices to prevent movement during concrete placement.

C. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.
1. Install wherever necessary to separate slab from other building members, including columns, walls, equipment foundations, footings, stairs, manholes, sumps, and drains.

D. Load Transfer Construction and Contraction Joints: Install load transfer devices as indicated; saw cut joint at surface as indicated for contraction joints.

E. Saw Cut Contraction Joints: Saw cut joints before concrete begins to cool, within **<<4 to 12 hours; or _____>>** after placing; use **<<3/16 inch (5 mm); ____ inch (____ mm)>>** thick blade and cut at least **<<1 inch (25 mm); ____ inch (____ mm)>>** deep but not less than **<<one quarter (1/4); or ____>>** the depth of the slab.

F. Contraction Joint Devices: Use preformed joint device, with top set flush with top of slab.

G. Construction Joints: Where not otherwise indicated, use metal combination screed and key form, with removable top section for joint sealant.

4.06 SEPARATE FLOOR TOPPINGS

A. Prior to placing floor topping,**<< roughen substrate concrete surface and; or None - N/A>>** remove deleterious material. Broom and vacuum clean.

B. Place required **<<dividers; edge strips; reinforcing; _____; and other items to be cast in>>**.

C. Apply bonding agent to substrate in accordance with manufacturer's instructions.

D. Apply sand and cement slurry coat on base course, immediately prior to placing toppings.

E. Place concrete floor toppings to required lines and levels.
   1. Place topping in checkerboard panels not to exceed **<<20 feet (6 m); ___ feet (___ m)>>** in either direction.

F. Screed toppings level, maintaining surface flatness of maximum **<<1:1000; or _____>>**.

4.07 FLOOR FLATNESS AND LEVELNESS TOLERANCES

A. An independent testing agency, as specified in Section **01 4000**, will inspect finished slabs for conformance to specified tolerances.

B. Maximum Variation of Surface Flatness:
   1. Exposed Concrete Floors: **<<1/4 inch (6 mm); 1/8 inch (3 mm); ____ inch (____ mm)>>** in **<<10 feet (3 m); ____ feet (____ m)>>**.
   2. Under Seamless Resilient Flooring: **<<1/4 inch (6 mm); 1/8 inch (3 mm); ____ inch (____ mm)>>** in **<<10 feet (3 m); ____ feet (____ m)>>**.
   3. Under Carpeting: **<<1/4 inch (6 mm); 1/8 inch (3 mm); ____ inch (____ mm)>>** in **<<10 feet (3 m); ____ feet (____ m)>>**.

C. Correct the slab surface if tolerances are less than specified.

E. Minimum F(F) Floor Flatness and F(L) Floor Levelness Values:
   1. Exposed to View and Foot Traffic: F(F) of 20; F(L) of 15**<<, on-grade only;, before removal of shoring; _____; or None - N/A>>**.
   2. Under Raised Access Flooring: F(F) of 20; F(L) of 15**<<, on-grade only;, before removal of shoring; _____; or None - N/A>>**.
   3. Under Thick-Bed Tile: F(F) of 20; F(L) of 15**<<, on-grade only;, before removal of shoring; _____; or None - N/A>>**.
   4. Under Carpeting: F(F) of 25; F(L) of 20**<<, on-grade only;, before removal of shoring; _____; or None - N/A>>**.
   5. Under Thin Resilient Flooring and Thinset Tile: F(F) of 35; F(L) of 25**<<, on-grade only;, before removal of shoring; _____; or None - N/A>>**.
   6. Parking Structure: F(F) of 20; F(L) of 15**<<, on-grade only;, before removal of shoring; _____; or None - N/A>>**.
   7. Warehouse Floors On Grade: F(F) of ____; F(L) of ____.

F. Measure F(F) Floor Flatness and F(L) Floor Levelness in accordance with ASTM E1155 (ASTM E1155M), within 48 hours after slab installation; report both composite overall values and local values for each measured section.

G. Correct the slab surface if composite overall value is less than specified and if local value is less than two-thirds of specified value or less than F(F) 13/F(L) 10.

I. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

4.08 CONCRETE FINISHING

A. Repair surface defects,**<<** ***including tie holes,; or None - N/A>>*** immediately after removing formwork.

B. Unexposed Form Finish: Rub down or chip off fins or other raised areas ***<<1/4 inch (6 mm); ___ inch (__ mm)>>*** or more in height.

C. Exposed Form Finish: Rub down or chip off and smooth fins or other raised areas ***<<1/4 inch (6 mm); ___ inch (__ mm)>>*** or more in height. Provide finish as follows:
   1. Smooth Rubbed Finish: Wet concrete and rub with carborundum brick or other abrasive, not more than 24 hours after form removal.
   2. Grout Cleaned Finish: Wet areas to be cleaned and apply grout mixture by brush or spray; scrub immediately to remove excess grout. After drying, rub vigorously with clean burlap, and keep moist for 36 hours.
   3. Cork Floated Finish: Immediately after form removal, apply grout with trowel or firm rubber float; compress grout with low-speed grinder, and apply final texture with cork float.

D. Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:
   1. Surfaces to Receive Thick Floor Coverings: "Wood float" as described in ACI 302.1R; thick floor coverings include ***<<quarry tile; ceramic tile; Portland cement terrazzo; and _____>>*** with full bed setting system.
   2. Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI 302.1R; thin floor coverings include ***<<carpeting; resilient flooring; seamless flooring; resinous matrix terrazzo; thin set quarry tile; thin set ceramic tile; and _____>>***.
   3. Decorative Exposed Surfaces: Trowel as described in ACI 302.1R; use steel-reinforced plastic trowel blades instead of steel blades to avoid black-burnish marks; decorative exposed surfaces include ***<<surfaces to be stained or dyed; pigmented concrete; surfaces to receive liquid hardeners; surfaces to receive dry-shake hardeners; surfaces to be polished; all other exposed slab surfaces; and _____>>***.
      a. Steel-Reinforced Plastic Trowel Blade Manufacturer: Wagman Metal Products, Inc: www.wagmanmetal.com.
   4. Other Surfaces to Be Left Exposed: Trowel as described in ACI 302.1R, minimizing burnish marks and other appearance defects.
   5. Chemical Hardener: See Section ***03 3511***.

E. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains ***<<at 1:100 nominal; at 1:50 nominal; at ____ nominal; or as indicated on drawings>>***.

4.09 CURING AND PROTECTION

A. Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
   1. Normal concrete: Not less than 7 days.
   2. High early strength concrete: Not less than 4 days.

C. Formed Surfaces: Cure by moist curing with forms in place for full curing period.

D. Surfaces Not in Contact with Forms:
   1. Slabs and Floors To Receive Adhesive-Applied Flooring: Curing compounds and other surface coatings are usually considered unacceptable by flooring and adhesive manufacturers. If such materials must be used, either obtain the approval of the flooring

and adhesive manufacturers prior to use or remove the surface coating after curing to flooring manufacturer's satisfaction.

2. Initial Curing: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by **<<*water ponding; water-saturated sand; water-fog spray; saturated burlap; or _____*>>**.
   a. Ponding: Maintain 100 percent coverage of water over floor slab areas, continuously for **<<*4; or ____*>>** days.
   b. Spraying: Spray water over floor slab areas and maintain wet.
   c. Saturated Burlap: Saturate burlap-polyethylene and place burlap-side down over floor slab areas, lapping ends and sides; maintain in place.
3. Final Curing: Begin after initial curing but before surface is dry.
   a. Moisture-Retaining Sheet: Lap strips not less than ***3 inches (75 mm)*** and seal with waterproof tape or adhesive; secure at edges.
   b. Curing Compound: Apply in two coats at right angles, using application rate recommended by manufacturer.

4.10 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section ***01 4000 - Quality Requirements***.

B. Provide free access to concrete operations at project site and cooperate with appointed firm.

C. Submit proposed mix design**<<** ***of each class of concrete; or None - N/A*>>** to**<<** ***inspection and; or None - N/A*>>** testing firm for review prior to commencement of concrete operations.

D. Tests of concrete and concrete materials may be performed at any time to ensure conformance with specified requirements.

E. Compressive Strength Tests: ASTM C39/C39M. For each test, mold and cure **<<*three; four; or _____*>>** concrete test cylinders. Obtain test samples for every **<<*100 cubic yards (76 cu m); 75 cubic yards (57 cu m); _____ cubic yards (_____ cu m)*>>** or less**<<** ***of each class; or None - N/A*>>** of concrete placed.

F. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.

G. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.

H. Slab Testing: Cooperate with manufacturer of specified moisture vapor reduction admixture (MVRA) to allow access for sampling and testing concrete for compliance with warranty requirements.

4.11 DEFECTIVE CONCRETE

A. Test Results: The testing agency shall report test results in writing to ***Architect*** and ***Contractor*** within 24 hours of test.

B. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.

C. Repair or replacement of defective concrete will be determined by the ***Architect***. The cost of additional testing shall be borne by ***Contractor*** when defective concrete is identified.

D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of ***Architect*** for each individual area.

4.12 PROTECTION

A. Do not permit traffic over unprotected concrete floor surface until fully cured.

4.13 SCHEDULE - CONCRETE TYPES AND FINISHES

A. Foundation Walls: ***3,000 pounds per square inch (20.7 MPa)*** 28 day concrete, form finish with honeycomb filled surface.

B. Underside of Supported Floors and Structure Exposed to View: ***4,000 pounds per square inch (27.6 MPa)*** 28 day concrete, form finish with honeycomb filled surface.

C. Exposed Portico Structure: ***4,000 pounds per square inch (27.6 MPa)*** 28 day concrete, air entrained, smooth rubbed finish.

END OF SECTION